Cunninghamia lanceolata

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Published in:
Seed Leaflet

Publication date:
2000

Document version
Også kaldet Forlagets PDF

Citation for published version (APA):
Jøker, D. (2000). Cunninghamia lanceolata. *Seed Leaflet*, (43).

SEED LEAFLET

No. 43 October 2000

Cunninghamia lanceolata (Lamb.) Hook.

Taxonomy and nomenclature

Family: Taxodiaceae

Synonyms: *Belis jaculifolia* Salisb., *B. lanceolata* (Salisb.) Sweet, *Cunninghamia chinensis* Vos, *C. sinensis* Rich., *Pinus lanceolata* Lamb., *Roxopitys cunninghamii* Nelson

Vernacular/common names: Chinese fir, China fir (Eng.); shamu, cisha, sha, zhengsha, mutoushu (Chin.); sapin de chine (Fr.); koyozan (Japan.)

Related species of interest: *C. konishii* is sometimes considered a variety or form of *C. lanceolata*. *C. konishii* has been believed indigenous to Taiwan but more recently two small stands have been found in northern Laos and in Vietnam. It has been heavily exploited for timber and is listed as vulnerable on the 2000 IUCN List of Endangered Species.

Distribution and habitat

Native to China where it has been cultivated for more than 8000 years and is one of the main plantation species. It is found in evergreen and deciduous mixed forests and in the southern part of China in the moist monsoon evergreen broad-leaved forest. In central China it can occasionally be found in secondary forests. Plantations have been established in a number of countries including Japan, Malaysia, South Africa, Argentina, Brazil and New Zealand.

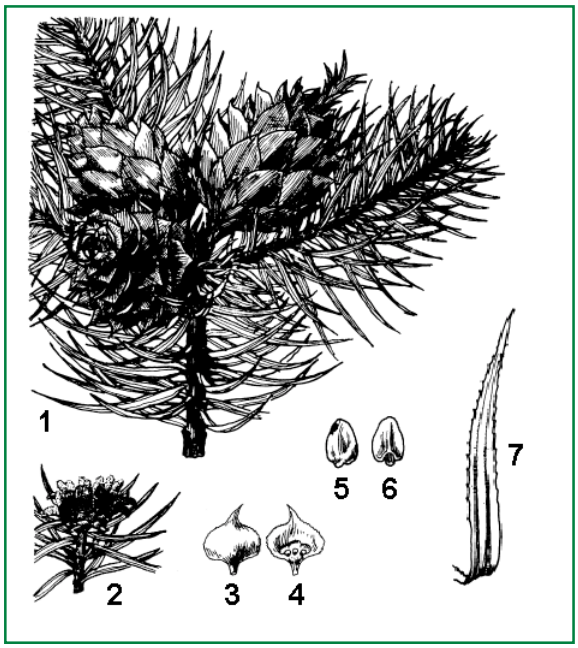
It grows from sea level up to 2600 m altitude in areas with mean annual rainfall of 900-2350 mm and mean annual temperature of 16-19°C. It is tolerant to frost although young trees may suffer damage below –15°C. Best growth is obtained on well-drained loamy soils with topsoil pH of 4.7-6.4 and C:N ratio 6.8-16.

Uses

The fast growth and desirable wood properties make it an important timber species and in China it accounts for 20-30% of the total commercial timber production. The wood has straight grain, uniform texture and only minor differences between early and late wood. It is used for house construction, poles, boats, vehicles, building and furniture. The older and larger branches are used in turnery.

It is a suitable species for agroforestry systems and is interplanted with a number of crops or with other tree species.

The interplanting is important not only to increase the income of farmers during early stages of plantations but also to avoid the land degradation that results from continuous cropping of *C. lanceolata*. The bark is used for tannin, paper and textiles and the branches for extracting an oil used in the perfume industry.



1, Fruiting branch; 2, cluster of male strobili; 3, back of a flowering scale; 4, cone-scale with three ovules; 5 and 6 seeds; 6, leaf. Ill.: Li Jiyuan.

Botanical description

Evergreen tree up to 30 m tall and 2.5-3.0 m in diameter. Bark dark brown, fissured, shedding in long strips. Branches in whorls, 5-6 together. Leaves linear-lanceolate, 3-6 cm long with finely serrated margins.

Male and female flowers in separate clusters at the end of the shoots. Female cones are ovoid or rounded, 2.5-5 cm long, 3-4 cm wide, solitary or several together; cone-scales brown with serrate margin and the apex elongated into a spine. The female cones are normally situated lower in the crown than the male cones.

Seed

On each scale there are three seeds: thin, 7-8 mm long and 4-5 mm wide, surrounded by a thin membranous wing. There are 130,000-150,000 seeds per kg.

Flowering and fruiting habit

Flowering and seed setting begin when the trees are 6-8 years old. Female flowers are formed in the autumn, enclosed in leafy scales that open in March-April. Male flowers blossom for 5-10 days in mid- to late March when the monthly temperature reaches 10-13°C. After successful pollination the scales around the female flowers close tightly and young cones are formed 10 days later. Seeds ripen in October-November. Empty cones remain on the tree for one or more years.

Harvest

The optimal time for harvest is 2-3 weeks after seed ripening, when the cones have turned from dark green to yellow brown. The cones are harvested using long hooks. Climbing is difficult because of the sharp needles.

Processing and handling

After harvest the seeds are afterripened in the shade for one week. 1 kg dry cones yields 30-50 g seed.

Storage and viability

The seeds are orthodox and should be dried to 8-10% moisture content. If stored in airtight containers, the seed will normally retain full viability for one year. They can be stored at 5°C and this may prolong storage.

Dormancy and pretreatment

The seeds have no dormancy and pretreatment is not necessary. Germination can be improved by soaking the seeds in warm water.

Sowing and germination

Seeds are sown in seed beds and seedlings pricked out into polytubes. If seeds are sown just after harvest in October-November they are ready for transplanting into the field in February-April when they are 35-40 cm tall. Germination begins after 7 days and is terminated after 20 days.

Vegetative propagation of this species is relatively easy, and earlier most planting stock was produced from coppices from basal stumps after felling. Nursery seedlings, however, have faster early growth and better survival than coppice sprouts. Since the 1980s, techniques have been developed to produce planting stock from root cuttings.

The cuttings are collected from the root collar when they reach a height of about 10 cm and placed in rooting beds. These cuttings have a survival rate of 90-95% and the quality is similar to that of seedling stocks. Cuttings from lateral shoots are not suitable.

Selected readings

Nguyen Ngoc Chinh et al., 1996. *Vietnam forest trees*. Hanoi, Vietnam: Agricultural Publishing House. 788p.

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C. lanceolata (>100-yr-old) in Southern Anhui, China. Height 25 m, diameter 1.1m. Photo: Li Jiyuan.

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